

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.' " M.P.E.P., § 601, 7th ed.

TRANSMITTAL LETTER
TO THE UNITED STATES ELECTED OFFICE (EO/US)
(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/JP00/00269	20 January 2000	26 January 1999
TITLE OF INVENTION		
METHOD AND DEVICE FOR DESCRIBING VIDEO CONTENTS		
APPLICANT(S)		
Tomio ECHIGO, Masato KUROKAWA, Junji MAEDA, Alberto TOMITA		

Box PCT
 Assistant Commissioner for Patents
 Washington D.C. 20231
 ATTENTION: EO/US

CERTIFICATION UNDER 37 C.F.R. §§ 1.8(a) and 1.10*
 (When using Express Mail, the Express Mail label number is **mandatory**;
 Express Mail certification is **optional**.)

I hereby certify that, on the date shown below, this correspondence is being:

MAILING

deposited with the United States Postal Service in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

37 C.F.R. § 1.8(a)

37 C.F.R. § 1.10 *

with sufficient postage as first class mail. as "Express Mail Post Office to Addressee"
 Mailing Label No. EL627430668US (mandatory)

TRANSMISSION

facsimile transmitted to the Patent and Trademark Office, (703) _____

Signature

Shauna Murphy

(type or print name of person certifying)

Date: 26 July 2001

* Only the date of filing (§ 1.6) will be the date used in a patent term adjustment calculation, although the date on any certificate of mailing or transmission under § 1.8 continues to be taken into account in determining timeliness. See § 1.703(f). Consider "Express Mail Post Office to Addressee" (§ 1.10) or facsimile transmission (§ 1.6(d)) for the reply to be accorded the earliest possible filing date for patent term adjustment calculations.

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NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

WARNING: Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8).

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:

- a. This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
- b. The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

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2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
□* TOTAL CLAIMS	9	9 - 20 =	0	× \$18.00 =	\$ 0
	INDEPENDENT CLAIMS	9	9 - 3 =	6	× \$80.00 =
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	480.00
BASIC FEE**	<input type="checkbox"/> U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <input type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) \$100.00 <input type="checkbox"/> and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) \$690.00				
	<input checked="" type="checkbox"/> U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <input type="checkbox"/> has been paid (37 C.F.R. § 1.492(a)(2)) \$710.00 <input type="checkbox"/> has not been paid (37 C.F.R. § 1.492(a)(3)) \$1000.00 <input checked="" type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) \$860.00				
SMALL ENTITY	Total of above Calculations				
	Reduction by 1/2 for filing by small entity, if applicable. Assertion must be made. (note 37 C.F.R. § 1.27)				
	Subtotal				
	Total National Fee				
	Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				

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*See attached Preliminary Amendment Reducing the Number of Claims.

Attached is a check money order in the amount of \$ _____

Authorization is hereby made to charge the amount of \$ 1,340.00

to Deposit Account No. 50-0510

to Credit card as shown on the attached credit card information authorization form PTO-2038.

WARNING: Credit card information should not be included on this form as it may become public.

Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

A duplicate of this paper is attached.

WARNING: "To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).

WARNING: If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.

Assertion of Small Entity Status

Applicant hereby asserts status as a small entity under 37 C.F.R. § 1.27.

NOTE: 37 C.F.R. § 1.27(c) deals with the assertion of small entity status, whether by a written specific declaration thereof or by payment as a small entity of the basic filing fee or the fee for the entry into the national phase as states:

"(c) Assertion of small entity status. Any party (person, small business concern or nonprofit organization) should make a determination, pursuant to paragraph (f) of this section, of entitlement to be accorded small entity status based on the definitions set forth in paragraph (a) of this section, and must, in order to establish small entity status for the purpose of paying small entity fees, actually make an assertion of entitlement to small entity status, in the manner set forth in paragraphs (c)(1) or (c)(3) of this section, in the application or patent in which such small entity fees are to be paid.

(1) Assertion by writing. Small entity status may be established by a written assertion of entitlement to small entity status. A written assertion must:

(i) Be clearly identifiable;
(ii) Be signed (see paragraph (c)(2) of this section); and

(iii) Convey the concept of entitlement to small entity status, such as by stating that applicant is a small entity, or that small entity status is entitled to be asserted for the application or patent. While no specific words or wording are required to assert small entity status, the intent to assert small entity status must be clearly indicated in order to comply with the assertion requirement.

(2) Parties who can sign and file the written assertion. The written assertion can be signed by:

(i) One of the parties identified in §§ 1.33(b) (e.g., an attorney or agent registered with the Office), §§ 3.73(b) of this chapter notwithstanding, who can also file the written assertion;

(ii) At least one of the individuals identified as an inventor (even though a §§ 1.63 executed oath or declaration has not been submitted), notwithstanding §§ 1.33(b)(4), who can also file the written assertion pursuant to the exception under §§ 1.33(b) of this part; or

(iii) An assignee of an undivided part interest, notwithstanding §§ 1.33(b)(3) and 3.73(b) of this chapter, but the partial assignee cannot file the assertion without resort to a party identified under §§ 1.33(b) of this part.

(3) Assertion by payment of the small entity basic filing or basic national fee. The payment, by any party, of the exact amount of one of the small entity basic filing fees set forth in §§ 1.16(a), (f), (g), (h), or (k), or one of the small entity basic national fees set forth in §§ 1.492(a)(1), (a)(2), (a)(3), (a)(4), or (a)(5), will be treated as a written assertion of entitlement to small entity status even if the type of basic filing or basic national fee is inadvertently selected in error.

(i) If the Office accords small entity status based on payment of a small entity basic filing or basic national fee under paragraph (c)(3) of this section that is not applicable to that application, any balance of the small entity fee that is applicable to that application will be due along with the appropriate surcharge set forth in §§ 1.16(e), or §§ 1.16(l).

(ii) The payment of any small entity fee other than those set forth in paragraph (c)(3) of this section (whether in the exact fee amount or not) will not be treated as a written assertion of entitlement to small entity status and will not be sufficient to establish small entity status in an application or a patent."

3. A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.

- a. is transmitted herewith.
- b. is not required, as the application was filed with the United States Receiving Office.
- c. has been transmitted
 - i. by the International Bureau.

Date of mailing of the application (from form PCT/1B/308):

ii. by applicant on _____. (Date)

4. A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

- a. is transmitted herewith.
- b. is not required as the application was filed in English.
- c. was previously transmitted by applicant on _____. (Date)
- d. will follow.

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5. Amendments to the claims of the International application under PCT Article 19
(35 U.S.C. § 371(c)(3));

NOTE: *The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected."* 1147 O.G. 29-40, at 36.

- a. are transmitted herewith.
- b. have been transmitted
 - i. by the International Bureau.

Date of mailing of the amendment (from form PCT/1B/308):

ii. by applicant on _____ (Date)

- c. have not been transmitted as
 - i. applicant chose not to make amendments under PCT Article 19.

Date of mailing of Search Report (from form PCT/ISA/210.):

4/18/00

- ii. the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. A translation of the amendments to the claims under PCT Article 19
(38 U.S.C. § 371(c)(3));

- a. is transmitted herewith.
- b. is not required as the amendments were made in the English language.
- c. has not been transmitted for reasons indicated at point 5(c) above.

7. A copy of the international examination report (PCT/IPEA/409)

is transmitted herewith.

is not required as the application was filed with the United States Receiving Office.

8. Annex(es) to the international preliminary examination report

- a. is/are transmitted herewith.
- b. is/are not required as the application was filed with the United States Receiving Office.

9. A translation of the annexes to the international preliminary examination report

- a. is transmitted herewith.
- b. is not required as the annexes are in the English language.

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10. An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

- a. was previously submitted by applicant on _____. (Date)
- b. is submitted herewith, and such oath or declaration
 - i. is attached to the application.
 - ii. identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.
- c. will follow.

II. Other document(s) or information included:

11. An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):

- a. is transmitted herewith.
- b. has been transmitted by the International Bureau.
Date of mailing (from form PCT/IB/308): _____
- c. is not required, as the application was searched by the United States International Searching Authority.
- d. will be transmitted promptly upon request.
- e. has been submitted by applicant on _____. (Date)

12. An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

- a. is transmitted herewith.

Also transmitted herewith is/are:

- Form PTO-1449 (PTO/SB/08A and 08B).
- Copies of citations listed.

b. will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).

c. was previously submitted by applicant on _____. (Date)

13. An assignment document is transmitted herewith for recording.

A separate "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or FORM PTO 1595 is also attached.

TO Follow: International Business Machines Corporation, Armonk, New York

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14. Additional documents:

- : a. Copy of request (PCT/RO/101)
- : b. International Publication No. WO 00/45335
 - i. Specification, claims and drawing
 - ii. Front page only
- : c. Preliminary amendment (37 C.F.R. § 1.121)
- : d. Other

15. The above checked items are being transmitted

- a. before 30 months from any claimed priority date.
- b. after 30 months.

16. Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

Please charge, in the manner authorized above, the following additional fees that may be required by this paper and during the entire pendency of this application:

- 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.

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37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims) 26 JUL 2001

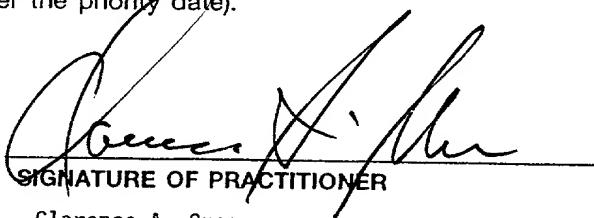
NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid on these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

37 C.F.R. § 1.17 (application processing fees)
 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).
 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).



SIGNATURE OF PRACTITIONER
Clarence A. Green

Reg. No.: 24,622

Tel. No.: (203) 259-1800

Customer No.: 2512

(type or print name of practitioner)

PERMAN & GREEN, LLP

P.O. Address

425 Post Road, Fairfield, CT 06430 USA

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SPECIFICATION

METHOD AND DEVICE FOR DESCRIBING VIDEO CONTENTS

Field of the Invention

The present invention relates to a method and an apparatus for describing contents of motion picture for the sake of efficient search based on contents of motion picture of a computer system capable of processing motion picture, in particular, video, DVD and so on.

Background art

While motion picture such as video data is easy for a human being to understand, there was a difficulty for a computer to manage it. Namely, it is difficult to find the meaning that the contents have from an original video data itself, and it has not been possible to date to accurately represent the meaning of video data even with advanced image processing technology.

While management of motion picture such as video data with a computer was conventionally based on annotations made by an administrator in advance, the method of using annotations lacks consistency in annotations among administrators, and besides, complicated processing for video data in large quantities is a big problem from now on.

As a candidate for the solution, it is considered promising to describe metacontents from video data with an intermediate result of image processing and knowledge registrable in advance that the contents have.

However, though it is possible to use plural image features for specific contents so as to describe a description method or a search engine for specific search or management, general versatility is lost and it does not contribute to proliferation of video search.

Therefore, a description method with general versatility taking advantage of image features is desired for description of video data, and the activities for standardization were started by ISO (International Organization for Standardization) as MPEG-7.

MPEG (Moving Picture Experts Group) is an organization promoting standardization of encoding method for storing color motion picture, and MPEG-1, MPEG-2 and MPEG-4 have been standardized so far.

Since MPEG-7 has no rule for a method of image processing and is beyond the scope of any standards, not only automatic processing but also manual data input is allowed.

However, it will only make data input more complicated to demand meaning of originally unextractable scene from video data or registration of data difficult to detect from video data. So far, there have been many examples of representing frame sequence of video as structured. For instance, Abe's method ("Method for Searching Moving Picture with Change of State over Time as Key", Abe, Sotomura, Shingakuron, pp.512-519, 1992 (conventional example 1)) describes a dynamic change of state so that the time intervals to be searched in video search may not be fixed.

In Abe's method (conventional example 1), however, since information of state description covers the entire frames, a drawback is that search time is in proportion to length of

the video used for search. Also, since an object is represented by the center of gravity in an image, it is substantially different from the present invention taking advantage of changes in an object's shape.

While the method described in conventional example 2, ("An Automatic Video Parser for TV Soccer Games," Y.Gong, C.H-Chuan, L.T.Sin, ACCV '95, pp.509-513, Nov., 1995) is trying to use information of positions and movement of the players, the positions are classified code of positions where the field is roughly divided into nine, and movement is of a very short period (several frames) so that event extraction is performed regarding classified code of positions and motion vector in a short period as events.

In conventional example 2, however, a drawback is that an event to be extracted and description are inseparable and besides, extractable events become a very limited set.

The method described in conventional example 3, ("Integrated Image and Speech Analysis for Content Based Video Indexing," Y-L.Chang, W.Zeng, I.Kamel, R.Alonso, ICMCS '96, pp.306-313, 1996) adopts a limited approach of tracking positions of the

ball and goal posts on the screen and considering only their positional relationship so as to extract time intervals of close distance as exciting scenes.

The method described in conventional example 4, ("Analysis and Presentation of Soccer Highlights from Video," D.Yow, B.L.Yeo, M.Yeung, B.Liu, ACCV '95, pp.499-502, 1995) performs shot extraction covering American football, and identifies events such as touchdown by a key word in each shot by speech recognition and line pattern extraction in the screen using image processing.

However, neither conventional example 3 nor 4 has a concept such as a player and his movement.

On the other hand, while there is also conventional example 5, ("A Suggestion of a Method for Image Search by Inquiries Using Words of Movement," Miyamori, Kasuya, Tominaga, Image media processing symposium '96, I-8, 13, 1996) as a method for representation which cuts an object from video and is based on lifetime and an object position, it has neither a concept of reference plane nor general versatility.

In addition, conventional example 6, ("A Suggestion of a

Method for Image Contents Search Using Description of Short Time Movement in a Scene," Miyamori, Maeda, Echigo, Nakano, Iisaku, MIRU-98, I-75, 1998) also describes an object with description of short time movement as a unit, but it lacks expandability since it does not simultaneously adopt description which represents a spatio-temporal trajectory and is a representation method dependent on specific contents.

Conventional example 7, ("On the Simultaneous Interpretation of Real World Image Sequences and Their Natural Language Description: The System SOCCER," E.Andre, G.Herzog, T.Rist, Proc. 8th ECAI, pp.449-454, 1988) is a system with scene description and interaction among objects as its meta data. However, the purpose of the system of conventional example 7 is conversion of medium from image to speech, namely a system for automatically generating a narration, so it does not store the created meta data and unlike the present invention, it does not have a data structure suitable for search of contents.

Conventional example 8, ("Automatic Classification of Tennis

Video for High-level Content-based Retrieval," G.Sudhir, J.C.M.Lee, A.K.Jain, Proc. CAIVD-98, pp.81-90, 1997) covers tennis matches, so description of interaction among objects is limited to simple movement and position information.

The present invention is limited, in terms of its descriptive contents, to processing results based on "feature colors," "texture," "shape" and "movement."

In video, a subject of attention is different depending on its contents. Therefore, it is necessary to predefine a subject object depending on the contents.

An object defined here consists of a lump region appearing in image, and it is possible to extract its color, texture, shape and movement.

It is a property of this object region that can be extracted from video, and it is difficult to give meaning to its contents.

Accordingly, a technique of description based on relationship between a single object and plural objects is proposed, and knowledge dependent on contents registrable in advance and description of objects are associated, and thus,

search based on an object of a meaningful scene in video becomes possible.

Since description of the entire frames of video data will result in storing of redundant information in large quantities, description for efficiently representing video contents with a little data volume is important.

The present invention is a proposal of a description method effective for interpretation based on video contents. The description method of the present invention is effective not only for search of an object or a scene but also for applications such as reuse of an object and summarization of contents.

An object of the present invention is to provide a description method for efficiently representing contents of motion picture with a little data volume.

Another object of the present invention is to propose a description method effective for interpretation based on contents of motion picture.

A further object of the present invention is to provide a description method not only for search of an object or a

scene but also capable of applications such as reuse of an object and summarization of contents.

Summary of the Invention

The present invention proposes a method for description in terms of relationship between a single object and plural objects based on data extractable as an image feature.

Namely, the present invention (1) represents a trajectory of how each object has moved over time by using reference plane representing position information of each object, (2) sets a description unit based on a type of action of each object by using changes in shape of each object, (3) has actions of each object represented as each behavioral section, and (4) comprises a description facility capable of reading and interpreting definition of an object dependent on video contents, definition of classes of actions, and definition of interpretation of a scene by interaction of plural objects.

Brief Description of the Drawings

Fig. 1 is a diagram showing cutting of video data on a computer to which the present invention is applied.

Fig. 2 is a diagram showing that position information and actions are assigned to a behavioral section of each object to which the present invention is applied.

Fig. 3 is a diagram showing a trajectory on reference plane of each object to which the present invention is applied.

Fig. 4 is a diagram showing an outline of a processing flow of video data on a computer to which the present invention is applied along with its main components.

Fig. 5 is a diagram showing a search screen of the present invention.

Fig. 6 is a diagram showing a search result of the present invention.

Preferred Embodiments

As main features of an object in image, there are "position" of an object, its "moving speed" and "trajectory."

However, in spite of conventional use of "position" information, position in description of video is mostly mere

implicit use of an image plane, and there is no method for using a different ground from the image plane depending on the contents.

In addition, an image is originally a three-dimensional scene projected on a two-dimensional plane, and there are cases where it is more convenient to take an object position not on an image plane but on a plane on which the object exists.

In general, sports images just fall under the cases where it is more convenient to take an object position not on an image plane but on a plane on which the object exists.

While a plane equivalent as world coordinates system is generally used for description of an object of the real world, it is different from video in the subject of description, purpose and in that it always takes the ground for a part of the real world.

On the other hand, since an image lacks information of a depth direction, it may be better to project consecutive frames of video on a common image plane.

From the above consideration, it is necessary to predefine

for each of the contents to be searched the ground for determining an object position which is called reference plane and described as follows by using "zone description" and a "camera model."

This description method allows effective description for the contents to which a geometrical relationship among objects is important.

Descriptions of reference plane, zone description and camera spec. are shown in attached Table 1. However, the description of camera spec. is not essential to the present invention but optional.

Next, representation method for each object is explained. An object moves on reference plane and performs meaningful behavior/actions in it.

For the contents in which behavior of an object may be a major factor in hitting the search, specifically the following description method is very effective.

A representation unit of an object is decomposed on the basis of behavior, and initiating and terminating frames representing its behavioral section and a trajectory between

them are described so as to reproduce an object position in an arbitrary frame.

While nothing represented changes in shape of each object in the background art, the present invention allows meaning of an object of a description unit to be preserved by giving meaning to changes in shape as behavior of an object due to such changes in shape.

This description is represented as Action (or described as Act) shown in attached Table 2.

An example of description using this Action is as follows.

```
Act("Kick", 10(frame), 240(frame), 3, 3, (120, 180, 0) (150,  
195, 180) (180, 223, 230))
```

By this description of Action, a representation of "An object (who) did the behavior indicated by action ID (what) on the space represented by a trajectory (where) in a time interval (when)" becomes possible.

Here, collinear approximation is used as a method for representing a trajectory. Data of a trajectory is

collinearly approximated, and the number of nodes, approximated coordinates on reference plane of each node and the time in Action are described. Consequently, if a certain time is specified, coordinate value of an object at the time can be uniquely determined.

Fig. 1 is a diagram conceptually representing description based on reference plane and a behavioral section of an object and description and data flow based on plural objects in soccer contents.

First, a video object based on the region is cut from video sequence, and lifetime of the object is acquired by tracing each object in the direction of time (131). Next, actions of the object are classified based on silhouette of the object which represents changes in shape of each object.

Description of objects is performed for each of these behavioral sections, which is Action description (132).

At this time, spatial movement of the object is represented as its trajectory by using reference plane. Objects present in the entire frames of video have Action description independently, and IAction (described later) is defined from

plural objects.

For simplicity, a trajectory in Act is described here limiting it only to that of two points. In addition, a trajectory of a ball is used as to spatial representation of IAct (described later). And in this case, information of a ball is described with a player's touch on a ball (kicking or receiving a ball) as a unit, regarding a touch between different players as a pass and a consecutive touches by the same player as a dribble.

If Fig. 1 is seen further in detail, a region based on color, texture and movement is cut from video sequence 101 and 102 (131). While this process is basically automated, it is also possible to modify it in each field by a tool for correcting regions extracted erroneously and oversplit regions.

Hereafter, the split moving regions are handled as video objects. Also, an object ID can be inserted at this time. Tracing of a region between neighboring fields is automatically determined by a size of the region where split regions are overlapping. A ball, as a special object, is

not currently cut, and manual input is performed with a tool for inputting a position of a ball on an image. 111 in Fig. 1 shows a conceptual diagram of the above data.

Next, a camera movement parameter is restored by tracing in each field a corner or a feature region on a still object in the background.

Position of a video object is represented on an image plane, which requires correction according to movement of a camera. Therefore, a virtual plane is assumed and the video of which a movement parameter is restored is projected on an image plane. Thus, data equivalent to restoring an object position in video which is input from a single camera is acquired. Moreover, since the camera is set to have an angle of depression against the ground, it can be handled not as a distance on an image plane but as a real distance by projecting the object position on the plane of the ground looked down on from the sky as reference plane. This is represented in Space 123 in Fig. 1 as a conceptual diagram which is continuous with time.

While the cut object is a video changing shape over time, in

this example, a silhouette disregarding internal color information is used in order to pay attention to changes in shape. Since changes in silhouette show specific changes according to actions, consecutive silhouettes of plural pre-instructed action patterns are unfolded in unique space so as to acquire changes unique to actions from high order eigenvalue.

Next, when input patterns are unfolded in the same unique space, the movement patterns are identified by seeking which instructed patterns they are closest to. This process requires a changing point in actions in a series of object actions to be acquired. While it is possible to acquire the changing point from the unique space, it is currently entered manually.

A series of objects can be described by plural actions, and just by entering an action ID and a frame number at a changing point in actions, it can be interpreted that all the objects in between were performing the same movements.

As above, while the data transformation described in Fig. 1 has processing which partly needs manual input support, it

is possible to generate data in a process which is expected to be automated in the future.

Fig. 2 is a diagram showing in detail the same drawing as TIME (124) in Fig. 1, but the subject video data is different.

Horizontal axis 292 in Fig. 2 represents time, and vertical axis 291 represents an object ID.

An object is described making the changing points of time of silhouettes 201 and 202 in Fig. 2 boundaries of description with an identified action ID as a minimum unit. The time intervals and object positions at the start/end of an action ID are described. Also, in order to trace an object trajectory, positions at plural points in a time interval are described. Accordingly, object positions can be approximated in all the frames.

200 in Fig. 2 is a conceptual diagram of objects according to the time intervals where Obj. 1-6 (203-208) represent the players, (A) and (B) represent the teams, and Obj. X (209) represents the ball.

Ball 209 is described as an object without an action ID.

For instance, Obj. 2 (A) is a player of team A and it runs during time interval 214, stays in time interval 224, kicks a ball in time interval 234, runs in time interval 244, kicks a ball in time interval 254, and runs in time interval 264. These actions are recorded with starting time, ending time and an object position (Px).

Fig. 3 shows movement of major players in the soccer scene for about 20 seconds in a solid line and movement of a ball in a dotted line. While Fig. 3 is a diagram showing in detail the same drawing as Space (123) in Fig. 1, but the subject video data is different.

These are the cases where the objects were extracted from the actual soccer scene and then the movement of each object on the field was reproduced by automatically extracting movement parameters of the camera. In the case of Fig. 3, a soccer field is set as reference plane.

The ball object (dotted line) is kicked first from position 312 and reaches position 314 near goal 340 after being kicked several times.

It shows that a player (solid line) has moved from position

322 to position 324 and another player has started from position 312 and moved to position 314.

In this way, a trajectory of each object in the video data on reference plane can be traced.

Next, while in general, plural objects simultaneously exist in an image and have different lifetimes and meanings respectively, it becomes possible to give meaning to a scene consisting of behavior of plural objects.

This is described as Interactive Action (IAction). IAAction (or described as IAct) is totally dependent on contents, and a different definition for each content or for each video database administrator may be used.

However, in order to facilitate consistency of description of IAAction and its application to a search engine, it is prescribed in this specification that IAAction is defined by logical operation with another IAAction and plural Actions.

Description of IAAction is shown in attached Table 3.

An example of description using this IAAction is as follows.

```
IAct("Pass", 20(frame), 35(frame), 2, 1, 2, Trajectory, 2,
```

(120, 180, 0) (160, 230, 15))

The above description of IAction is a description of "when, where, who did what." The differences from the above Action are that its subject is plural objects and that the location is specified in a voluntary manner.

In the example of soccer mentioned later, a trajectory of a ball is used as spatial representation of an event.

As an example, descriptions of a "Pass" to which meaning is given by two objects and a "Through Pass" represented by AND of other objects are explained.

Here, it is assumed that the database described by the above Act and IAct actually exists. It is defined for convenience' sake that a through pass is "a pass made between players A and B, and the ball went through between players C and D of the defense side who were there at the time the pass was made."

In the present invention, it is defined as to determine the following. 1. There was an IAct ("pass") between certain two players. 2. There were two other players of the defense

side in that time interval (there are two Acts sharing a time interval with 1, and the object which performed the two Acts belongs to a different team from the objects of 1). 3. The trajectory of the pass went through between the two players (in the shared time interval, the trajectory of the ball intersects the line linking the two players of the defense side).

Here, the IAct statement is described in attached Table 4. An example of definition of an IAct through pass is shown in attached Table 5.

As an example of application of the present invention, description in a soccer game is shown. In soccer, a type of play defined from a single object and a type of actions defined by relationship of plural objects are used as description items. Moreover, in soccer, description of a ball object is used as a special object.

Description of a ball itself can be represented likewise, namely an action ID is omitted in the Action description of the above object and the object ID is a ball.

The following description defines IAction in soccer

contents, and description using Action and IAction is also possible to other contents.

It can be considered a useful description method for the contents such as the present invention in which representation of behavior of an object and positional relationship on reference plane is effective, since there are a number of examples of application such as sports other than soccer, measurement of traffic and video surveillance, etc.

Here, a ball object is described as follows.

```
ball ( StartTime, EndTime, number of Nodes, Trajectory )
```

There are the following types of actions of a single object used in soccer.

```
Activity = { lie, sit, fall_down, raise_hand, dive,  
hand_throw, throw_in, jump, stay, walk, run, sliding, kick,  
overhead_kick }
```

Namely, lie, sit, fall_down, raise_hand, dive, hand_throw, throw_in, jump, stay, walk, run, sliding, kick, overhead_kick, and so on can be considered in general.

As examples of actions, a pass (lines 1 to 26 in Table 6), a long pass (lines 28 to 39 in Table 6), a feed pass (lines 1 to 14 in Table 7), a cross pass (lines 16 to 33 in Table 7), a gain pass (lines 1 to 18 in Table 8), centering (lines 20 to 38 in Table 8), and a wall pass (lines 1 to 36 in Table 9) are described.

As definition of a through pass as an example of IAct was already explained in detail referring to Table 5, detailed explanation of these examples is not given here.

In addition, the groups of auxiliary functions used in IAct are shown in attached Tables 10 and 11. See the groups of auxiliary functions for the meanings of the functions used in the above examples (see attached Tables 6 to 9).

Fig. 4 shows the steps necessary for searching video data and related data groups (see attached Tables 10 and 11).

Video data 401 is processed by image processing 410 and the results are stored as data groups of 420. For instance,

region map 422 is acquired from a region cutting process, an object trajectory ID (424) from identification of an object, an action ID (426) from classification of actions, camera parameter 428 from camera action restoring process, etc.

However, these processes are not only completely automated processes but also the cases of formatting data with manual support after generation and manually inputting as data directly from video data 401.

From these data groups of 420, Act 430, namely video description according to the objects is obtained.

Also, from the definition obtained in advance by selecting video data 401, description of reference plane (Refplane) 442 for video data 401 is obtained.

Furthermore, by selecting video data 401, scene description IAct 456 describing meaning given to a scene consisting of behavior of plural objects is obtained, which is predefined for interpreting video data 401.

As an application of this description, to search video data 401, a user will enter user keyword 470 to search engine 460. Search engine 460 interprets user keyword 470 and

returns a time interval of corresponding video data 401 from object description 430 and scene description 456 to display on video to the user.

At this time, scene description 456 returns a corresponding time interval by processing Refplane 422 and Act 430.

Moreover, a user is allowed a description equivalent to scene description IAct 456 for search engine 460, and Refplane 422 and Act 430 are processed for a user-defined scene description so that a time interval of a user-defined scene is returned and displayed on video to the user.

Fig. 5 shows a screen for searching video.

It is possible for a user to search a desired scene by selecting a necessary item in search screen 500 and starting search.

In the case of a soccer video explained so far, it is possible to perform specification of players 510, specification of time 520, specification of location (place) 530, and specification of action 540.

As to specification of players, it is thinkable to specify them by team name, individual name or position.

In the case of specification of action, it is possible to use the actions defined in the above-mentioned Action and IAction. For instance, it is possible to use Actions such as lie, sit, fall_down, raise_hand, dive, hand_throw, throw_in, jump, stay, walk, run, sliding, kick or overhead_kick, or IActions such as a pass, a through pass or a centering. Moreover, a user may also newly define a scene.

Fig. 6 shows screen 600 of a search result of a scene in the case of specifying a through pass for an action in Fig. 5. For instance, the search result in this case is one, and image 610 at the start of the scene is displayed. Generally, a desired scene is replayed by clicking this image 610 of the search result.

Advantages of the Invention

It is possible, by adopting the above-mentioned organization of the present invention, to provide a description method for effectively representing contents of motion picture with a small data volume.

Also, a description method effective for interpretation based on contents of motion picture becomes possible by adopting the organization of the present invention.

Furthermore, it becomes possible, by adopting the organization of the present invention, to provide a description method of motion picture capable of applications such as reuse of an object and summarization of contents in addition to search for an object or a scene.

As a summary, other embodiments are described below.

A description means for contents of motion picture, the means comprising of:

- (a) means for setting reference plane;
- (b) means for describing each object on the motion picture by position on the reference plane and predefined type of actions; and
- (c) means for describing each scene by using the means for describing each object.

A search means for contents of motion picture, the means comprising of:

- (a) means for setting reference plane;
- (b) means for describing each object on the motion picture by position on the reference plane and predefined type of actions;
- (c) means for describing each scene by using the means for describing each object; and
- (d) means for searching motion picture by using the means for describing each object or the means for describing each scene.

A description method for motion picture, the method comprising the steps of:

- (a) determining reference plane which represents information of object positions included in the motion picture;
- (b) representing changes over time of each object on the reference plane as a trajectory;
- (c) setting a description unit based on predefined type of actions of each object by using changes in shape of each

object so as to assign actions of each object as each behavioral section; and

- (d) defining each scene by plural objects.

A search method for motion picture, the method comprising the steps of:

- (a) setting reference plane which represents information of object positions included in the motion picture;
- (b) representing changes over time of each object on the reference plane as a trajectory;
- (c) setting a description unit based on predefined type of actions of each object by using changes in shape of each object so as to assign actions of each object as each behavioral section;
- (d) defining each scene by plural objects; and
- (e) searching a specific scene by using the actions of each object or the scene.

A description method for motion picture, the method comprising the steps of:

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- (a) determining reference plane from the motion picture;
- (b) cutting a region map, an object trajectory ID, an action ID and a camera parameter from the motion picture;
- (c) creating description of actions by each object from the region map, the object trajectory ID, the action ID and the camera parameter; and
- (d) creating description of scenes by using the description of actions by each object.

A description method for motion picture, the method comprising the steps of:

- (a) determining reference plane from the motion picture;
- (b) cutting a region map, an object trajectory ID, an action ID and a camera parameter from the motion picture;
- (c) creating description of actions by each object from the region map, the object trajectory ID, the action ID and the camera parameter; and
- (d) creating description of scenes by using the description of actions by each object.

A description method for motion picture, the method comprising the steps of:

- (a) cutting a region map, an object trajectory ID, an action ID and a camera parameter from the motion picture;
- (b) creating description of actions by each object from the region map, the object trajectory ID, the action ID and the camera parameter; and
- (c) creating description of scenes by using the description of actions by each object.

A computer readable storage medium which has recorded management data for searching motion picture, the management data comprising of:

- (a) data of description of actions by each object defined by position on reference plane and predefined type of actions; and
- (b) data of description of scenes defined by the data of description of actions.

A computer readable storage medium which has recorded a

program, the program having a computer execute the steps of:

- (a) determining reference plane which represents information of object positions included in the motion picture;
- (b) representing changes over time of each object on the reference plane as a trajectory;
- (c) setting a description unit based on predefined type of actions of each object by using changes in shape of each object so as to assign actions of each object as each behavioral section; and
- (d) defining each scene by plural objects.

Description of the Symbols

- 401: Video data
- 410: Image processing
- 420: Data groups
- 422: Region map
- 424: Object trajectory ID
- 426: Action ID
- 428: Camera parameter
- 430: Act description

442: Reference plane description

456: IAct description

460: Search engine

470: User keyword

Claims

1. A description means for contents of motion picture, said means comprising of:

- (a) means for setting reference plane;
- (b) means for describing each object on said motion picture by position on said reference plane and predefined type of actions; and
- (c) means for describing each scene by using said means for describing each object.

2. A search means for contents of motion picture, said means comprising of:

- (a) means for setting reference plane;
- (b) means for describing each object on said motion picture by position on said reference plane and predefined type of

actions;

(c) means for describing each scene by using said means for describing each object; and

(d) means for searching motion picture by using said means for describing each object or said means for describing each scene.

3. A description method for motion picture, said method comprising the steps of:

(a) determining reference plane which represents information of object positions included in said motion picture;

(b) representing changes over time of each object on said reference plane as a trajectory;

(c) setting a description unit based on predefined type of actions of each object by using changes in shape of each object so as to assign actions of each object as each behavioral section; and

(d) defining each scene by plural objects.

4. A search method for motion picture, said method

comprising the steps of:

- (a) setting reference plane which represents information of object positions included in said motion picture;
- (b) representing changes over time of each object on said reference plane as a trajectory;
- (c) setting a description unit based on predefined type of actions of each object by using changes in shape of each object so as to assign actions of each object as each behavioral section;
- (d) defining each scene by plural objects; and
- (e) searching a specific scene by using said actions of each object or said scene.

5. A description method for motion picture, said method comprising the steps of:

- (a) determining reference plane from said motion picture;
- (b) cutting a region map, an object trajectory ID, an action ID and a camera parameter from said motion picture;
- (c) creating description of actions by each object from said region map, said object trajectory ID, said action ID and

said camera parameter; and

(d) creating description of scenes by using said description of actions by each object.

6. A description method for motion picture, said method comprising the steps of:

(a) determining reference plane from said motion picture;

(b) cutting a region map, an object trajectory ID, an action ID and a camera parameter from said motion picture;

(c) creating description of actions by each object from said region map, said object trajectory ID, said action ID and said camera parameter; and

(d) creating description of scenes by using said description of actions by each object.

7. A description method for motion picture, said method comprising the steps of:

(a) cutting a region map, an object trajectory ID, an action ID and a camera parameter from said motion picture;

(b) creating description of actions by each object from said

region map, said object trajectory ID, said action ID and said camera parameter; and

(c) creating description of scenes by using said description of actions by each object.

8. A computer readable storage medium which has recorded management data for searching motion picture, said management data comprising of:

(a) data of description of actions by each object defined by position on reference plane and predefined type of actions; and

(b) data of description of scenes defined by said data of description of actions.

9. A computer readable storage medium which has recorded a program, said program having a computer execute the steps of:

(a) determining reference plane which represents information of object positions included in said motion picture;

(b) representing changes over time of each object on said

reference plane as a trajectory;

(c) setting a description unit based on predefined type of actions of each object by using changes in shape of each object so as to assign actions of each object as each behavioral section; and

(d) defining each scene by plural objects.

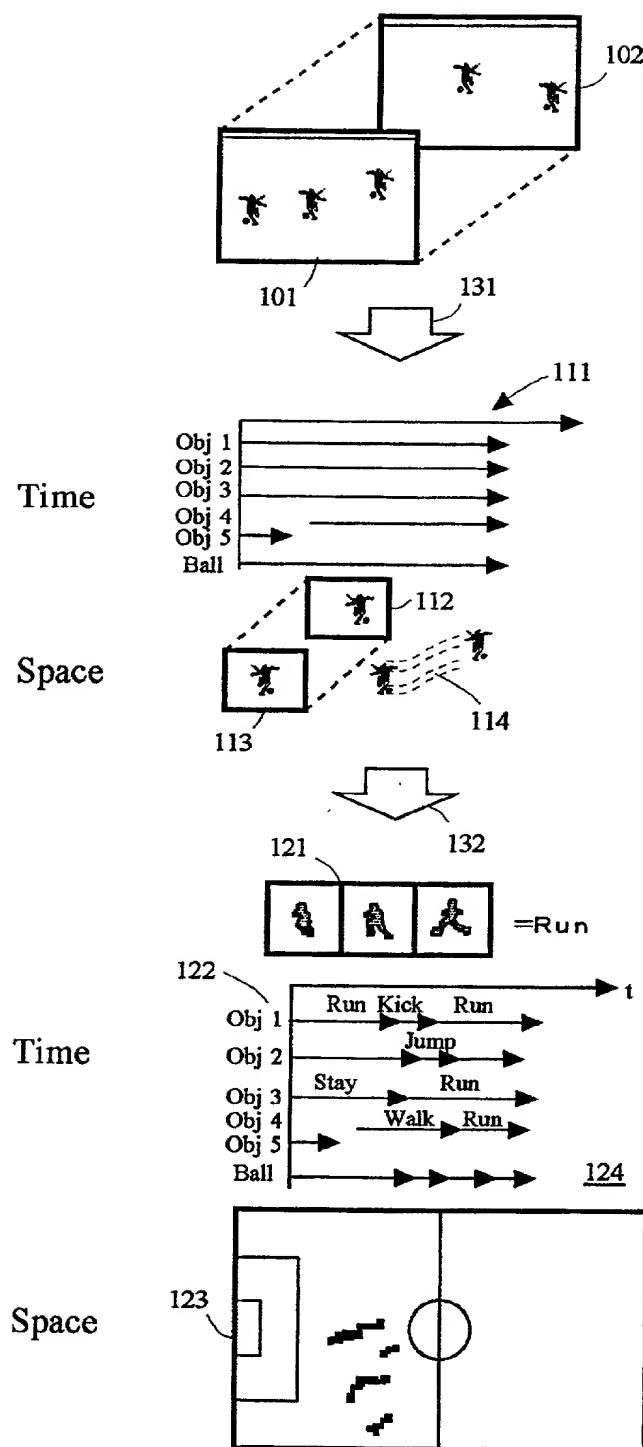
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Fig. 1

Die Begriffe der Geometrie sind nicht definiert, sondern sie sind intuitiv verstanden.

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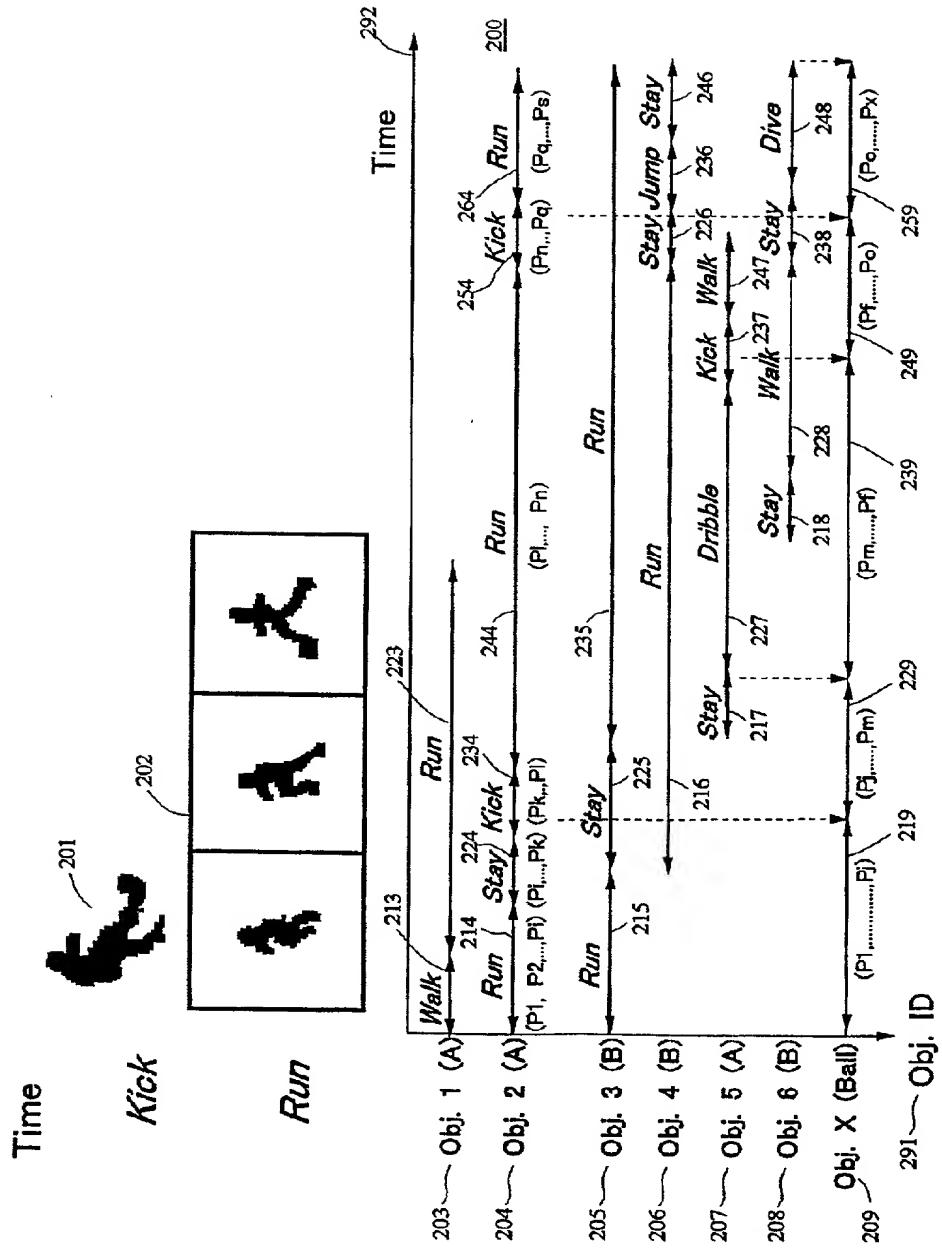


Fig. 2

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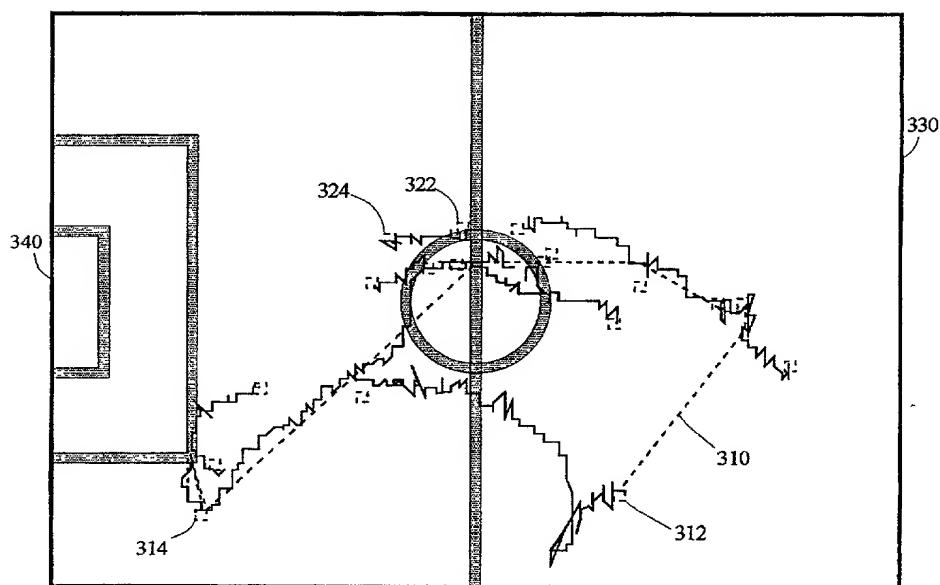


Fig. 3

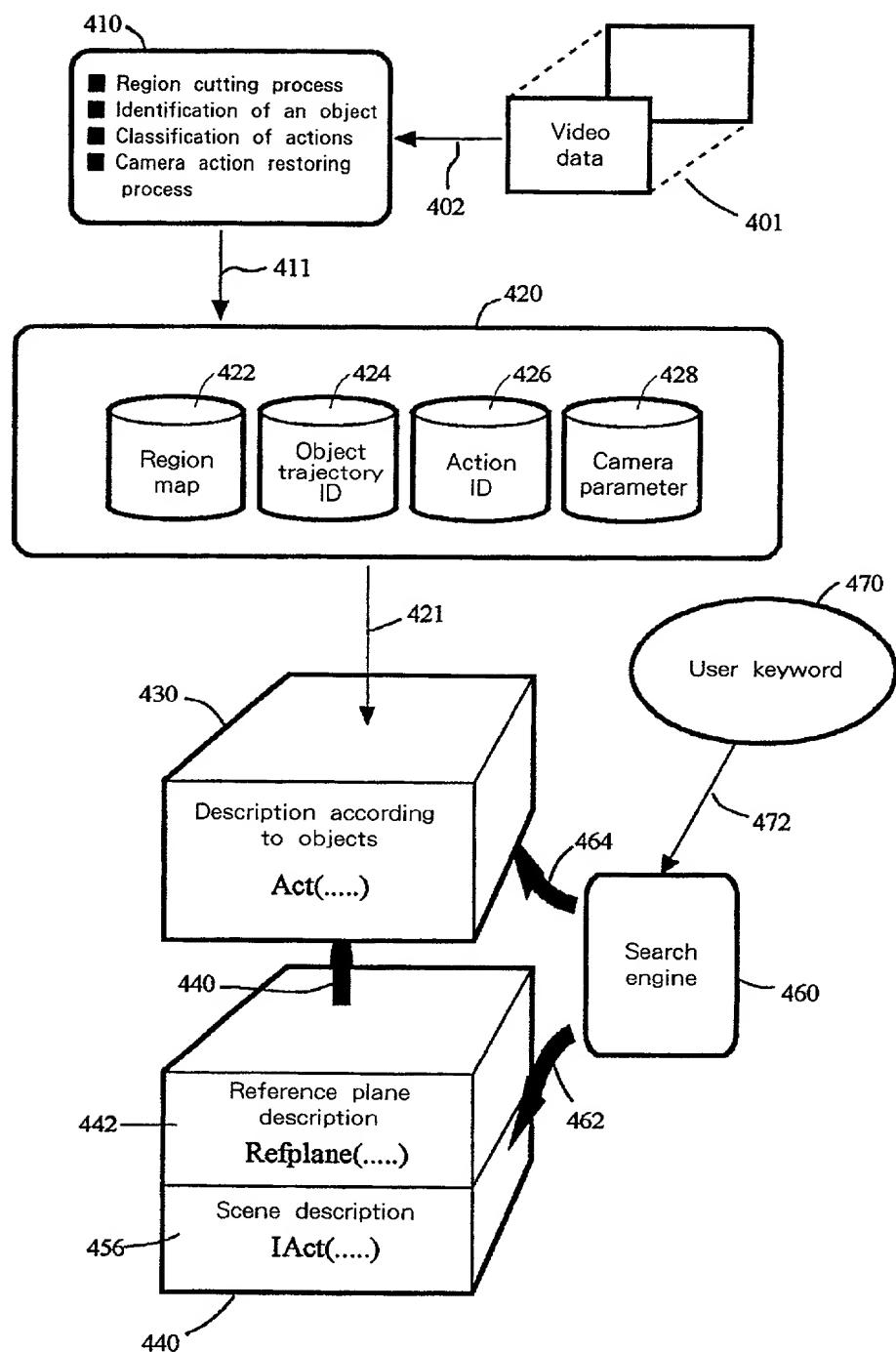


Fig. 4

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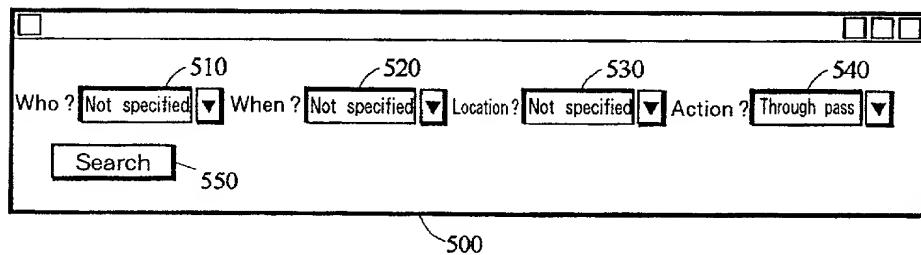


Fig. 5

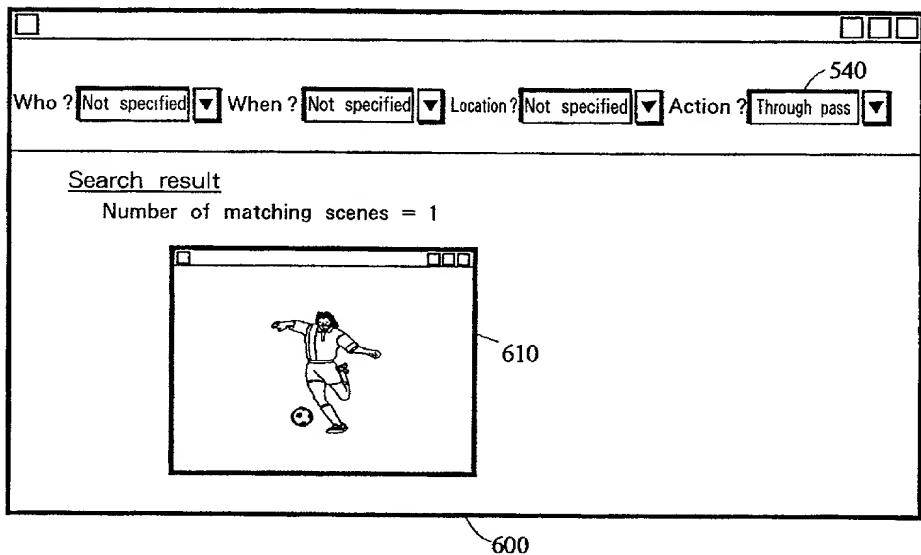


Fig. 6

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[Table 1]

Description of Reference plane:

Reference plane::= Model of the ground

<Ref ID> text	----- Name of reference plane
<Plane> coordinates	----- Center of the Area (e.g. (0,0))
<Metric> array of numeric	----- define transformation (e.g. 3 × 3 matrix for Affine transformation)

Description of Zone Description:

Zone Description::= Define meaningful space on the ground

<Zone ID> text	----- Identified the zone on the ground (e.g. Goal, Center line)
<Space> space desc	----- define the space on the ground

Description of Camera Spec (option):

Camera Spec::= Define camera model

<Camera Type> text	----- Identify camera model
<Param Array> array of numeric	----- define model transformation

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[Table 2]

Description of Action:

Action:: Describe single player's action

<Action ID> text ----- Action Symbol (e.g. Run, Kick Walk, etc)
(text representing types of actions)

<T-Interval> time interval ----- Time Interval of this action (represented
by starting and ending times)

<Object ID> numeric ----- Object Identifier (object of this action)

<Trajectory> Time Stamped Polyline
(a line with a time attribute of each node) ----- Trajectory of the player in this action
(trajectory of an object on reference plane
in the time interval of this action)

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[Table 3]

Description of IAction:

IAction::= Meaningful event in the domain, composed of multiple players and ball

<IAction ID> text ----- Event Symbol
(e.g. Shot, Pass, Through Pass, etc)
(text representing types of events)

<T-Interval> time interval ----- Time interval of this action

<No of Object> numeric ----- Number of Objects

<Object ID> array of numeric ----- Array of Objects identifier

<Space> Trajectory ----- Spatial description of this action
Polylines, Polygons

[Table 4]

Definition of IAct:

begin

 Definition of IAct

 A list of an IAct, a child Act and a child ball (a child IAct and a child Act, etc. mean an IAct and an Act comprising this IAct)

 where

 [All the judgment parts and judgment statements with auxiliary functions are linked by AND]

 fill

 [An element assignment part of a defined IAct]

 end

Here, variable symbols in a define statement have respective types which are represented by a first character of each variable. The types are as follows.

Type Description

f	a frame
t	a time interval (consisting of starting and ending frames)
o	an object
O	a group of objects (consisting of a set of objects and the number of them)
p	a point (consisting of spatial component x and y)
P	a group of points (consisting of a set of points and the number of them)
A	a group of points, which means a polyline linking them
l	a time point (consisting of spatial component x, y and time component t)
L	a group of time points (consisting of a set of time points and the number of them)
i	an integer
d	a real number

[Table 5]

Line	Define statement	Description
1	begin	Beginning
2	iact Through_pass t0 O0 L0	Here, it defines an iact "Through Pass".
3	child_iact 1 Pass t1 O1 L1	iact pass as one comprising this iact.
4	child_act 3 Stay Walk Run t2 o2 false L2	And an Act of defense side player 1 (it means that a player with object ID o2 (Stayed, Walked or Ran) moving on trajectory L2 during time interval t2).
5		
6	child_act 3 Stay Walk Run t3 o3 false L3	An Act of defense side player 2.
7	where	
8	greater_than o2 o3	Two players of the defense side have different object IDs (their IDs are o2, o3).
9	get_object_from_GO o4 1 O1	Take the first player of iact ("Pass") to put in variable o4.
10	not_same_team o4 o2	o4 and o2 are different teams.
11	not_same_team o4 o3	o4 and o3 are different teams.
12	set_length_of_polyline d0 L1	Length of a pass is measured.
13	less_than d0 20.0	Length of 20 m or less.
14	temporal_overlap t2 t3	Two players of the defense side have overlapping time intervals.
15	set_temporal_overlapping_period t4 t2 t3	The overlapping time intervals to variable t4.
16	temporal_overlap t1 t4	There is an overlap in time intervals of t4 and an iact pass.
17	set_temporal_overlapping_period t5 t1 t4	Overlapping time intervals (consequently, overlapping Acts and iact passes of the two players of the defense side) to variable t5.
18	get_frame_start_of_period f0 t5	Put a starting frame of time interval t5 in time point f0.
19	get_frame_end_of_period f1 t5	Put an ending frame of time interval t5 in time point f1.
20	set_ST_GL_dividing_point p0 L2 f0	The position (location) of player 1 of the defense side at time point f0 to variable p0.
21	setS_ST_GL_dividing_point p1 L3 f0	The position (location) of player 2 of the defense side at time point f0 to variable p1.
22	set_ST_GL_dividing_point p2 L2 f1	The position (location) of player 1 of the defense side at time point f1 to variable p2.
23	set_ST_GL_dividing_point p3 L3 f1	The position (location) of player 1 of the defense side at time point f1 to variable p3.
24	get_point_from_polyline p4 1 L1	The starting point of a pass to p4.
25	get_point_from_polyline p5 -1 L1	The ending point of a pass to p5.
26	Create_line P1 2 p4 p5	Create a line linking p4 and p5 (a pass course).
27	Create_line P2 2 p0 p1	A line linking p0 and p1 (a line linking the two players of the defense side at time point f0).
28	Create_line P3 2 p2 P3	A line linking p2 and p3 (a line linking the two players of the defense side at time point f1).
29	spatial_cross P1 P2	P1 and P2 are crossing.
30	set_distance_point_and_line d1 p0 p4 p5	The distance from pass course p0 at time point f0 is sought.
31	set_distance_point_and_line d2 p1 p4 p5	The distance from pass course p1 at time point f0 is sought.
32	less_than d1 7.0	The distance is 7 m or less.
33	less_than d2 7.0	Same.
34	spatial_cross P1 P3	P1 and P are crossing.
35	set_distance_point_and_line d3 p2 p4 p5	The distance from a pass course at time point f1 is sought as above.
36	set_distance_point_and_line d4 p3 p4 p5	
37	less_than d3 7.0	The distance is 7 m or less.
38	less_than d4 7.0	
39	fill	If the above conditions are met,
40	t0 t1	Assign the time interval of t1 (iact pass) to t0 (the time interval of an iact through pass).
41	O0 O1	Assign the group of objects of O1 (iact pass) to O1 (the group of objects of an iact through pass).
42	L0 L1	Assign L1 (a trajectory of iact pass) to L0 (spatial representation of iact through pass).
43	end	End.

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[Table 6]

Line Define statement

```
1 pass:  
2 begin  
3 Iact Pass t0 O0 L0  
4 Child_act Kick|Jump|Sliding t1 o1 L1  
5 Child_act Run|Stay|Walk t2 o2 L2  
6 Ball t3 L3  
7 where  
8 same_team(o1,o2)  
9 get_frame_start_period f1 t3  
10 get_frame_end_period f2 t3  
11 temporal_overlap t1 t3  
12 temporal_overlap t2 t3  
13 set_ST_GL_dividing_point p1 f1 L3  
14 set_ST_GL_dividing_point p2 f2 L3  
15 set_ST_GL_dividing_point p3 f1 L1  
16 set_ST_GL_dividing_point p4 f2 L2  
17 set_distance_point_to_point d1 p1 p3  
18 set_distance_point_to_point d2 p2 p4  
19 Less_than d1 0.5  
20 Less_than d2 0.5  
21 set_Go_from_objects O1 2 o1 o2  
22 fill  
23 t0 t3  
24 L0 L3  
25 O0 O1  
26 End  
27  
28 long pass:  
29 begin  
30 iact Long_pass t0 O0 L0  
31 child_iact Pass t1 O1 L1  
32 where  
33 set_length_of_polyline d0 L1  
34 Greater_Than d1 30.0  
35 fill  
36 t0 t1  
37 O0 O1  
38 L0 L1  
39 end
```

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[Table 7]

Line Define statement

```
1 feed pass:  
2 begin  
3 Iact Feed Pass t0 O0 L0  
4 Child_Iact Pass t1 O1 L1  
5 Child_act Run t2 o2 L2  
6 where  
7 get_object_from GO o3 -1 O1  
8 same_object o2 o3  
9 temporal_during t1 t2  
10 fill  
11 t0 t1  
12 O0 O1  
13 L0 L1  
14 end  
15  
16 cross pass:  
17 begin  
18 Iact Cross pass t0 O0 L0  
19 Child_Iact Pass t1 O1 L1  
20 where  
21 get_frame_start_period f1 t1  
22 get_frame_end_period f2 t1  
23 set_ST_GL_dividing_point p1 f1 L1  
24 set_ST_GL_dividing_point p2 f2 L1  
25 set_length_of_polyline d1 L1  
26 set_X_distance_point_and_point d2 p1 p2  
27 greater_than d1 30.0  
28 less_than d2 5.0  
29 fill  
30 t0 t1  
31 O0 O1  
32 L0 L1  
33 end
```

[Table 8]

Line Define statement

```
1 gain pass:  
2 begin  
3 Iact Gain_pass t0 O0 L0  
4 Child_Iact Pass t1 O1 L1  
5 where  
6 get_frame_start_period f1 t1  
7 get_frame_end_period f2 t1  
8 set_ST_GL_dividing_point p1 f1 L1  
9 set_ST_GL_dividing_point p2 f2 L1  
10 set_length_of_Polyline d1 L1  
11 set_Y_distance_point_and_point d2 p1 p2  
12 greater_than d1 30.0  
13 less_than d2 5.0  
14 fill  
15 t0 t1  
16 O0 O1  
17 L0 L1  
18 end  
19  
20 centering:  
21 begin  
22 Iact Cross pass t0 O0 L0  
23 Child_Iact Pass t1 O1 L1  
24 where  
25 get_frame_start_period f1 t1  
26 get_frame_end_period f2 t1  
27 set_ST_GL_dividing_point p1 f1 L1  
28 set_ST_GL_dividing_point p2 f2 L1  
29 set_length_of_Polyline d1 L1  
30 greater_than d1 8.0  
31 set_X_distance_point_and_point d2 p1 p2  
32 less_than d2 5.0  
33 spatial_point_in p2,"Goal Area"  
34 fill  
35 t0 t1  
36 O0 O1  
37 L0 L1  
38 end
```

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[Table 9]

Line Define statement

```
1 wall pass:  
2 begin  
3 iact 1-2_pass t0 O0 L0  
4 child_iact Pass t1 O1 L1  
5 child_iact Pass t2 O2 L2  
6 child_act Stay Walk Run t3 o1 L3  
7 where  
8 get_object_from_GO o2 1 O1  
9 get_object_from_GO o3 -1 O1  
10 get_object_from_GO o4 1 O2  
11 get_object_from_GO o5 -1 O2  
12 not_same_team o1 o2  
13 same_object o2 o5  
14 same_object o3 o4  
15 set_temporal_distance_period i1 t1 t2  
16 Less_Than i1 5  
17 not_same_team o1 o2  
18 set_temporal_concatination_period t4 t1 t2  
19 temporal_during t3 t4  
20 get_frame_start_of_period f1 t4  
21 get_frame_end_of_period f2 t1  
22 get_frame_end_of_period f3 t4  
23 set_ST_GL_dividing_point p1 L1 f1  
24 set_ST_GL_dividing_point p2 L1 f2  
25 set_ST_GL_dividing_point p3 L2 f3  
26 Create_Area A1 3 p1 p2 p3  
27 set_ST_GL_dividing_point p4 L3 f1  
28 set_ST_GL_dividing_point p5 L3 f3  
29 spatial_point_in p4 A1  
30 spatial_point_in p5 A1  
31 set_ST_GL_concatinate_polyline L4 L1 L2  
32 fill  
33 t0 t4  
34 O0 O1  
35 L0 L4  
36 end
```

[Table 10]

List of group of auxiliary functions:

(1) Functions suitable for soccer

same_team (Player0, Player1)

same_team (Player, Location)

It shows whether Player0 and Player1 belong to the same team.

One of them may represent a position such as "GOAL."

(2) Functions that generally hold apart from soccer

#	[Temporal]	
1	get_frame_start_of_period (f1,t1)	Assign the starting point of time interval t1 to f1.
2	get_frame_end_of_period (f1,t1)	Assign the ending point of time interval t1 to f1.
3	set_period_from_frames (t1,f1,f2)	Create time interval t1 from two time points f1, f2.
4	get_period_of_GL (t1,L1)	Assign the lifetime interval of trajectory L1 to time interval t1.
5	temporal_in (f1,t1)	Time point f1 is inside time interval t1.
6	temporal_meet (t1,t2)	t1 and t2 exist in this order, and ending point of t1 and starting point of t2 are the same.
7	temporal_overlap (t1,t2)	There is a time interval overlapping time intervals t1 and t2.
8	temporal_start (t1,t2)	Time intervals t1 and t2 have the same starting point.
9	temporal_finish (t1,t2)	Time intervals t1 and t2 have the same ending point.
10	temporal_during (t1,t2)	Time interval t1 is completely included in time interval t2.
11	temporal_equal (t1,t2)	Time intervals t1 and t2 have the same starting and ending points.
12	temporal_before (t1,t2)	Time interval t1 ends earlier than the starting point of t2. No overlapping time interval.
13	set_temporal_overlapping_period (t1,t2,t3)	Assign the overlapping time intervals of t2 and t3 to t1.
14	set_temporal_concatination_period (t1,t2,t3)	Assign the concatenated time intervals of t2 and t3 to t1.
15	set_temporal_distance_period (i1,t2,t3)	Assign the difference between ending point of time interval t2 and starting point of t3 to i1.
16	set_ST_GL_dividing_locus (L1,t1,L2)	Assign to L1 the trajectory of a part applicable to partial interval t1 of the lifetime interval of trajectory L2.
17	set_ST_GL_concatinate_locus (L1,L2,L3)	Assign to L1 the trajectory concatenating trajectories L2 and L3.
	[Spatial]	
18	set_ST_GL_dividing_point (p1,L1,f1)	Assign the position of trajectory L1 at time point f0 to p1.
19	set_point_from_locus (p1,i1)	Convert a point i1 of trajectory data to position data p1.
20	set_point (p1,i1,i2)	Define position p1 of which x, y coordinates are i1, i2.
21	Create_Polyline (P1,i1,p1,p2,...)	Create line P1 linking point sets made up of p1, p2, ... (the number, i1).

[Table 11]

(2) Functions that generally hold apart from soccer (continued)

#	[Temporal]	
22	Create_Area (A1,i1,p1,p2,...)	Create polyline A1 linking point sets made up of p1, p2, ... (the number, i1).
23	set_length_of_polyline (d1,X1)	Assign the length of the line shown by X1 to d1. X1 is P or L.
24	set_deistance_point_and_point (d1,p1,p2)	Assign the Euclid's distance between positions x1 and x2 to d1. x is p or 1.
25	set_X_distance_point_and_point (d1,x1,x2)	Assign the distance on axis x between positions x1 and x2 to d1. x is p or 1.
26	set_Y_distance_point_and_point (d1,x1,x2)	Assign the distance on axis y between positions x1 and x2 to d1. x is p or 1.
27	set_distance_point_and_line (d1,x1,P1)	Assign the distance between position x1 and line P1 to d1. x is p or 1.
28	set_distance_point_and_Area (d1,x1,A1)	Assign the distance between position x1 and polyline A1 to d1. x is p or 1.
29	spatial_point_in (p1,X1)	Position p1 is included in X1. X is P or A.
30	spatial_line_in (P1,A1)	Line P1 is completely included in polyline A1.
31	spatial_apart (P1,P2)	No overlap of two lines p1 and p2.
32	Spatial_line_touch (P1,X1)	There is a shared point between P1 and X1. X is P or A.
33	spatial_through (P1,A1)	P1 is penetrating polyline A1.
34	spatial_overlap (A1,A2)	Two polylines A1 & A2 are partly overlapping.
35	spatial_contain (A1,A2)	A1 is completely included in A2.
36	spatial_area_touch (A1,A2)	A1 and A2 are touching at a point or a line.
37	spatial_disjoint (A1,A2)	No shared part between A1 and A2.
38	spatial_cross (P1,P2)	Two lines P1 and P2 are crossing.
	[Object handling]	
39	same_object (o1,o2)	Two objects o1 & o2 are the same objects.
40	not_same_object (o1,o2)	Two objects o1 & o2 are different.
41	get_object_from_GO (o1,i1,O1)	i1-th element of set of object O1 is o1.
42	set_GO_from_objects (O1,i1,o1,o2,...)	Create object set O1 from o1, o2...
43	get_number_from_GO (i1,O1)	To i1 seeking the number of elements of object set O1.
	[Numerical}	
44	greater_than (x1,x2)	x1 > x2, x is f, d, o.
45	less_than (x1,x2)	x1 < x2, x is f, d, o.
46	equal (x1,x2)	x1 = x2, x is f, d, o.

IN THE UNITED STATES ELECTED OFFICE (EO/US)

PCT/JP00/00269 (US: 09/890,168) 20 January 2000 26 January 1999
INTERNATIONAL APPLICATION NO. INTERNATIONAL FILING DATE PRIORITY DATE CLAIMED

METHOD AND DEVICE FOR DESCRIBING VIDEO CONTENTS

TITLE OF INVENTION

Tomio ECHIGO, Masato KUROKAWA, Junji MAEDA, Alberto TOMITA
APPLICANT(S)

Box PCT

Assistant Commissioner for Patents

Washington, D.C. 20231

ATTENTION: EO/US

**COMPLETION OF FILING REQUIREMENTS
FOR INTERNATIONAL APPLICATION ENTERING U.S. NATIONAL STAGE
IN U.S. ELECTED OFFICE (EO/US) UNDER 35 U.S.C. § 371**

CERTIFICATION UNDER 37 C.F.R. §§ 1.8(a) and 1.10*

(When using Express Mail, the Express Mail label number is mandatory;
Express Mail certification is optional.)

I hereby certify that, on the date shown below, this correspondence is being:

MAILING

deposited with the United States Postal Service in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

37 C.F.R. § 1.8(a)

37 C.F.R. § 1.10 *

with sufficient postage as first class mail. as "Express Mail Post Office to Addressee"
Mailing Label No. EL627510675US (mandatory)

TRANSMISSION

facsimile transmitted to the Patent and Trademark Office, (703) _____


Signature

Elaine Mian

(type or print name of person certifying)

* Only the date of filing (§ 1.6) will be the date used in a patent term adjustment calculation, although the date on any certificate of mailing or transmission under § 1.8 continues to be taken into account in determining timeliness. See § 1.703(f). Consider "Express Mail Post Office to Addressee" (§ 1.10) or facsimile transmission (§ 1.6(d)) for the reply to be accorded the earliest possible filing date for patent term adjustment calculations.

(Completion of Filing Requirements for International Application Entering U.S. Elected Office (EO/US)
[13-19]—page 1 of 5)

(Check and complete the applicable item, if applicable)

- This replies to the Notice of Missing Requirements under 35 U.S.C. § 371 and 37 C.F.R. § 1.495 (FORM PCT/DO/EO/905).
- A copy of FORM PCT/DO/EO/905 accompanies this response.

WARNING: Where the items being submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (because international application papers are not covered by an ordinary certificate of mailing. 37 C.F.R. § 108(2)(xi)).

NOTE: Documents and fees must be clearly identified as a submission to enter the national stage under 35 U.S.C. § 371. Otherwise, the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.495(g).

DECLARATION OR OATH

I. No original declaration or oath was filed. Enclosed is the original declaration or oath for this application.

OR

The declaration or oath that was filed was determined to be defective. A new original oath or declaration is attached.

NOTE: For surcharge fee for filing declaration after filing date complete item JV(2).

NOTE: Acceptable minimums in the declaration in an ordinarily filed U.S. application for identification of the specification to which it applies are:

- (A) application number (consisting of the series code and the serial number, e.g., 08/123,456);
- (B) serial number and filing date;
- (C) attorney docket number which was on the specification as filed;
- (D) title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or
- (E) title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number, e.g., 08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration.

M.P.E.P. § 601.01(a), 7th ed. Notice of September 12, 1983 (1035 O.G. 3). See M.P.E.P. § 601.01(a), 7th ed.

NOTE: Another minimum found acceptable in the declaration is the filing date (i.e., date of express mail) and the express mail number, useful where the serial number is not yet known. But note the practice where the express mail deposit is a Saturday, Sunday or holiday within the District of Columbia. 37 C.F.R. § 1.10(c).

NOTE: See 37 C.F.R. § 1.41(a).

The original oath was objected to. A new original oath is attached.

(complete (c) or (d), if applicable)

Attached is a

- (c) Statement by a registered attorney that the application filed in the PTO is the application that the inventor executed by signing the declaration.
- (d) Statement that the "attached" specification is a copy of the specification and any amendments thereto that were filed in the PTO to obtain the filing date.

II.

(complete as applicable)

An amendment in accordance with 37 C.F.R. § 1.121 is attached.
 The attached amendment cancels claims _____ inclusive.

**TRANSMITTAL OF ENGLISH TRANSLATION
OF NON-ENGLISH LANGUAGE PAPERS**

III. Submitted herewith is an English translation of the non-English language international application papers as originally filed. It is requested that this translation be used as the copy for examination purposes in the PTO. (See 37 C.F.R. § 1.495(c))

NOTE: For fee for processing a non-English application, complete item IV(3).

NOTE: A non-English oath or declaration in the form provided or approved by the PTO need not be translated. 37 C.F.R. § 1.69(b).

FEES**IV.**

NOTE: See 37 C.F.R. § 1.28(a).

1. Fees for claims

each independent claim in excess of 3
(37 C.F.R. § 1.492(b))—\$ 84.00 small entity—\$42.00 \$ _____
 each claim in excess of 20
(37 C.F.R. § 1.492(c))—\$18.00; small entity—\$9.00 \$ _____
 multiple dependent claims(s)
(37 C.F.R. § 1.492(d))—\$280.00 small entity—\$ 140.00 \$ _____

2. Surcharge fees

surcharge set forth in 37 C.F.R. § 1.492(e) for accepting the declaration later than 30 months after the priority date in filing an application in the U.S. as a designated office—\$130.00; small entity—\$65.00 \$ 130.00

NOTE: The processing fee in the next item 3 below is not subject to a reduction for small entity status.

3. processing fee set forth in 37 C.F.R. § 1.492(f) for acceptance of an English translation later than 30 months after the priority date—\$130.00 \$ _____

Total fees \$ 130.00

SMALL ENTITY STATUS

V. a. An assertion that this filing is by a small entity

NOTE: See 37 C.F.R. § 1.28(a).

(check and complete applicable items)

is attached.
 was filed on _____.
 was made by paying the basic national fee as a small entity.
 is being made now by paying the basic national fee as a small entity.
b. A separate refund request accompanies this paper.

EXTENSION OF TIME

(complete (a) or (b), as applicable)

VI. The proceedings herein are for a patent application. Accordingly, the provisions of 37 C.F.R. § 1.136(a) apply.

(a) Applicant petitions for an extension of time, the fees for which are set out in 37 C.F.R. § 1.17(a)(1)-(4), for the total number of months checked out below:

<input type="checkbox"/> one month	\$ 110.00	\$ 55.00
<input type="checkbox"/> two months	\$ 400.00	\$200.00
<input type="checkbox"/> three months	\$ 920.00	\$460.00
<input type="checkbox"/> four months	\$ 1,440.00	\$720.00
<input type="checkbox"/> five months	\$ 1,960.00	\$980.00

Fee: \$ _____

If an additional extension of time is required, please consider this a petition therefor.

(check and complete the next item, if applicable)

An extension for _____ months has already been secured. The fee paid therefor of \$ _____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request \$ _____

or

(b) Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

TOTAL FEE DUE

VII. The total fee due is:

Completion fee(s)	\$ 130.00
Extension fee (if any)	\$ _____
TOTAL FEE DUE \$ 130.00	

PAYMENT OF FEES

VIII.

Attached is a check money order in the amount of \$ _____

Authorization is hereby made to charge the amount of \$ 130.00

to Deposit Account No. 50-0510

to Credit card as shown on the attached credit card information authorization form PTO-2038.

WARNING: Credit card information should not be included on this form as it may become public.

Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

A duplicate of this paper is attached.

(Completion of Filing Requirements for International Application Entering U.S. Elected Office (EO/US)
[13-19]—page 4 of 5)

AUTHORIZATION TO CHARGE ADDITIONAL FEES

IX.

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

Please charge, in the manner authorized above, the following additional fees that may be required by this paper and during the entire pendency of this application:

37 C.F.R. §§ 1.492(a)(1), 1.492(a)(4) (filing fees)

37 C.F.R. § 1.492(b), (c), and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

37 C.F.R. § 1.17 (application processing fees)

37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).

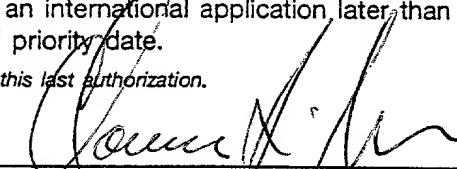
37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b)).

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

37 C.F.R. § 1.492(e) and/or (f) surcharge fees for filing the declaration and/or an English translation of an international application later than 30 months from the earliest-claimed priority date.

WARNING: It would be wise to always check this last authorization.



SIGNATURE OF PRACTITIONER

Clarence A. Green

(type or print name of practitioner)

Reg. No.: 24,622

Tel. No.: (203) 259-1800

Customer No.:

425 Post Road,

P.O. Address

Fairfield, Connecticut 06430

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Title: METHOD AND DEVICE FOR DESCRIBING VIDEO CONTENTS

the specification of which

(check one)

is attached hereto.

X was filed on as United States Application No.09/890,168 or PCT International Application Number PCT/JP00/00269 filed on January 20, 2000 and was amended on (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International Application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

(Number)	(Country)	(Day/Month/Year Filed)	<u>Priority Not Claimed</u>
----------	-----------	------------------------	-----------------------------

PCT/JP00/00269	PCT	20 January 2000	<input type="checkbox"/>
11/016554	Japan	26 January 1999	<input type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U.S.C. Section 120 of any United States application(s), or Section 365(c) of any PCT International Application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International Application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C.F.R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)

(Filing Date)

(Status)

(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)

(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)

(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

Manny W. Scheeter (31,722)
John E. Noel (26,279)
Joseph C. Redmond, Jr. (18,753)
Robert M. Trepp (25,933)
Daniel P. Morris (32,053)
Marian Underweiser (46,134)
Gail Zarick (43,303)
Derek S. Jennings (41,473)

Lauren C. Bruzzone (35,082)
Christopher A. Hughes (26,914)
Louis J. Pereollo (33,206)
Stephen C. Kaufman (29,551)
Paul J. Otterstedt (37,411)
Louis P. Herzberg (41,500)
Douglas W. Cameron (31,596)
Edward A. Pennington (32,588)

All attorneys listed under Customer No.: 2512

Send Correspondence to:
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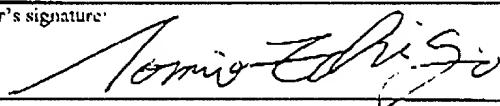
Direct Telephone Calls to: (name and telephone number)

Reg. No.: (203) 259-1800

Full name of sole or first inventor:

Tomio ECHIGO

Sole or first inventor's signature:



DATE

2001/10/10

Residence:

714-1 Kamiyama-cho, Midori-ku, Yokohama-shi, Kanagawa-ken, Japan P X

Citizenship:

Japan

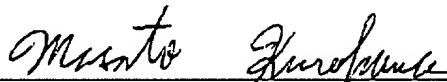
Post Office Address:

714-1 Kamiyama-cho, Midori-ku, Yokohama-shi, Kanagawa-ken, Japan

Full name of second inventor:

Masato KUROKAWA

Second inventor's signature:



DATE

2001/10/10

Residence address:

5-16 Tsutsujigaoka, Aoba-ku, Yokohama-shi, Kanagawa-ken, Japan P X

Citizenship:

Japan

Post Office Address:

5-16 Tsutsujigaoka, Aoba-ku, Yokohama-shi, Kanagawa-ken, Japan

3-00

Full name of third inventor:

Junji MAEDA

Third Inventor's signature:

Junji Maeda

DATE

2001/10/10

Residence address:

1-30-9-206 Kaminoge, Setagaya-ku, Tokyo-to, Japan JPY

Citizenship:

Japan

Post Office Address:

1-30-9-206 Kaminoge, Setagaya-ku, Tokyo-to, Japan

4-00

Full name of fourth inventor:

Alberto TOMITA

Fourth inventor's signature:

AT

DATE

Oct. 22, 2001

Residence address:

5-6-2 Utsukushigaoka, Aoba-ku, Yokohama-shi, Kanagawa-ken, Japan JPY

Citizenship:

Brazil

Post Office Address:

5-6-2 Utsukushigaoka, Aoba-ku, Yokohama-shi, Kanagawa-ken, Japan

Full name of fifth inventor:

Fifth inventor's signature:

DATE

Residence address:

Citizenship:

Post Office Address:

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